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THE GENUS FRACCHIAEA[1]

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(WITH PLATE 10)

As originally delimited the genus *Fracchiaea* Saccardo consisted of the single newly described species, *Fr. heterogenea* Sacc., based on several collections of material made on branches of *Acer, Aesculus, Buxus, Lonicera,* and *Rhamnus* in Italy. Later a few species previously placed in *Sphaeria* were transfered to *Fracchiaea,* and a number of new species were described. A total of twenty-two species and six varieties have been listed in Saccardo's Sylloge Fungorum, and two[2] additional forms, a species and a variety, have been named. The genus has not been critically studied. The only general treatment of the group is that of Berlese (**4**).

Since the perithecium in several of the species is strikingly similar in form and structure to that of *Nitschkia* the present investigation was undertaken in the endeavor to determine whether these two genera are in reality closely related. In the writer's monographic study of the Nitschkieae (**12**) *Fracchiaea* is said to be "apparently not widely separated from the group."

During the past year through the courteous coöperation of a number of mycologists[3] in this country and abroad it has been

[1] The investigation upon which the article is based was in part supported by a grant from the Heckscher Foundation for the Advancement of Research established by August Heckscher at Cornell University.

[2] *Fr. australis* Spegazzini in herb. and *Fr. heterogenea v. aculeata* v. Höhnel in herb. for which no published descriptions have been seen.

[3] The herbaria of the New York Botanical Garden, Harvard University, and the Bureau of Plant Industry have been visited, and all the material of *Fracchiaea* available at these institutions and at Cornell University has been

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possible to examine and compare the type specimens of practically all the species which have been referred to the genus. It is now evident that *Fracchiaea* must be incorporated in the Nitschkieae. It differs from the other genera of the group only in that the asci are polysporous and in the non-cupulate aspect of the perithecia. In all other essential respects the agreement is marked. The genus is here treated, therefore, as a member of the Nitschkieae, attention being called to the fact that although the cupulate form of the perithecium, so characteristic of the other members of the group, is not usually assumed, it has been observed in a few collections.

A comparative study of material representing various species of the genus reveals that a diversity of forms has been included. Of the thirty species and varieties which have been established ten are here definitely excluded from the genus, and four, material of which is unavailable, remain as doubtful. The facts concerning each case are discussed below under the heading "doubtful and excluded forms." Some of these species have little in common except the polysporous nature of their asci. One, *Fr. microspora*, is a discomycete.

The remaining sixteen species and varieties are recognized as belonging to the genus, but the conclusion has been reached that they should all be merged as one species. The genus as here considered is consequently monotypic. In view of the fact that Berlese (**4**) has recognized the majority of these forms as distinct species, the facts which indicate that they are identical will be emphasized.

In an examination of material representing the various forms a striking similarity is at once noted. The most characteristic structure is the ascus. It is somewhat variable in shape and size, but the oblique arrangement of the overlapping spores in parallel series is the same in all cases. The spores vary slightly in length in different collections but the differences do not afford a tangible basis for separation of species. The perithecium in external aspect is

examined. The writer wishes to express his appreciation of the privileges accorded him by the curators of these herbaria, and to thank those individuals who have mailed specimens for examination.

distinctive, the habit being the same, and the spines [4] being characteristic. An examination of the figures published by Berlese (**4**) reveals many points of apparent difference in the various species, especially with reference to the aspect of the perithecium in longitudinal section. As pictured by him the perithecium of *Fr. pauridia* is seated directly on the substratum, is wholly devoid of stromatic tissue, and in form is sub-globose instead of turbinate. In *Fr. eucalyptina* it is shown to be smooth while in *Fr. brevibarbata* it is covered with prominent warts or spines. The ascus of *Fr. brevibarbata* is pictured as long-stalked, and is said to differ in this respect from that of *Fr. heterogenea*. These features and others including differences in measurements of perithecia, asci, and spores constitute the bases for separation of the species recognized. In the endeavor to verify Berlese's observations a critical study of type specimens and other collections of material has been made. The differences indicated have either been found to be wholly lacking or to be so inconstant or intangible as to be worthless as characters for the separation of species. Moreover, no other characters have been brought to light which can be so used.

SYSTEMATIC ACCOUNT

FRACCHIAEA Saccardo Atti Soc. Veneto-Trentina Sci. Nat. **2**: 163–164. *pl. 12. fig. 3–7.* 1873 (in honor Joseph Fracchia).

Type species, *Fracchiaea heterogenea* Sacc.

Perithecia black, coriaceous-carbonaceous, turbinate, cespitose on a pseudoparenchymatous stroma, erumpent, characteristically spiny, apically obscurely ostiolate, only rarely collapsing to cupulate, the basal portion solid and pseudoparenchymatous, the terminal portion enclosing a subspheric ascigerous cavity; asci thin-walled but not strikingly evanescent, polysporous, clavate, narrowed below, sometimes long-stipitate; ascospores allantoid, slightly curved, arranged obliquely in the ascus in several longitudinal rows, more or less clearly centrally uni-septate, hyaline, yellowish in the ascus.

[4] In European collections the spines are less commonly provided with secondary barbs than is the case in North American specimens. In two South American collections the tips of the spines are sometimes forked.

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Probably most closely allied to *Calyculosphaeria*, but in the presence of perithecial spines also recalling *Acanthonitschkea*.

1. FRACCHIAEA HETEROGENEA Sacc., Mycol. Ven. Spec. Atti Soc. Veneto-Trentina Scienze Nat. **2**: 163. 1873.

? *Sphaeria rasa* Berkeley, in Hooker, Flora New Zealand **2**: 205. 1855.

Sphaeria subcongregata Berk. & Curt. nom. nud., in Rav. F. Carol. **4**: *57*. 1855.

Sphaeria brevibarbata Berk. & Curt., nom. nud. in Herb. Berk.

Cucurbitaria brevibarbata Berk & Curt., Grevillea **4**: 47. 1876.

Sphaeria subconnata Berk. & Curt., Grevillea **4**: 141. 1876.

Gibbera moricarpa Cooke, Grevillea **7**: 51. 1878.

Fracchiaea cucurbitarioides Speg., F. Argent. **2**: 21. 1880.

Coelosphaeria subconnata (Berk. & Curt.) Sacc., Syll. Fung. **1**: 93. 1882.

Fracchiaea brevibarbata (Berk. & Curt.) Sacc., Syll. Fung. **1**: 94. 1882.

Fracchiaea moricarpa (Cooke) Sacc., Syll. Fung. **1**: 94. 1882.

? *Fracchiaea rasa* (Berk.) Sacc., Syll. Fung. **1**: 95. 1882.

Sphaeria subconvexa Berk. & Rav. nom. nud., in Cooke, Grevillea **15**: 83. 1887.

Fracchiaea subconnata (Berk. & Curt.) Cooke, Grevillea **15**: 83. 1887.

Fracchiaea americana Berlese, Fungi Moricolae Fasc. 5. No. 1. 1888.

Fracchiaea glomerata Patouillard, Jour. de Bot. **3**: 168. 1889.

Sphaeria pauridia Berk. & Curt. nom. nud. in Herb. Curtis.

Nitschkia pauridia Cooke, Grevillea **20**: 107. 1892.

Fracchiaea subcongregata (Berk. & Curt.) E. & E., North Amer. Pyren. 244. 1892.

Nitschkia subconnata (Berk. & Curt.) Kuntze, Rev. Gen. **3**^{2}: 501. 1898.

Fracchiaea pauridia (Berk. & Curt.) Berlese, Icon. Fung. **3**: 25. 1900.

Fracchiaea eucalyptina Berlese, Icon. Fung. **3**: *27*. 1900.

Fracchiaea cucurbitarioides f. *eucalyptina* (Berl.) Speg. Ann. Mus. Nac. Buenos Aires **19**: 333. 1909.

Fracchiaea cucurbitarioides f. *Pini-insignis* Speg., Ann. Mus. Nac. Buenos Aires **19**: 333. 1909.

Fracchiaea cucurbitarioides f. *Quercus-sessiliflorae* Speg. Ann. Mus. Nac. Buenos Aires **19**: 334. 1909.

Fracchiaea cucurbitarioides f. *cecropiicola* Speg. nom. nud. in Herb. Speg.

Fracchiaea heterogenea v. *aculeata* v. Höhnel. nom. nud. in Herb. v. Höhnel.

ILLUSTRATIONS: Berl. Ic. Fung. **3**: *pl. 31–35;* Berl. Fung. Moricolae fasc. 5. *pl. 15. fig. 1–6;* Sacc. Myc. Ven. Spec. **2**: *pl. 12. figs. 4–17.*

(Figures 1–4)

Perithecia erumpent through crevices in the bark, cespitose, forming pulvinate, hemispheric to more or less elongated or irregular groups 1–10 mm. in diameter containing usually 5–30 but sometimes as many as 100 individuals, borne on a relatively inconspicuous though well developed pseudoparenchymatous stroma from which brown, septate hyphae 3.5–6 μ in diameter penetrate into the wood, black, dull to shiny, prominently spiny, turbinate, often irregular from lateral pressure, 350–650 μ in diameter, provided at the apex with a somewhat obscure papilliform ostiolum, sometimes becoming umbilicate, rarely collapsing to definitely cupulate, in section strikingly resembling the perithecia of *Nitschkia* in form and cellular structure; perithecial spines numerous, attaining 25 μ in length, approximately 10 μ in diameter at the base, tapering uniformly to the sharp-pointed tip, usually provided with secondary barbs which are progressively larger toward the base of the primary spine, black, opaque, in some cases apically forked; asci clavate, thin-walled, polysporous, rounded at the apex, narrowed toward the base which is often very long-stipitate, 50–95 x 14–27 μ (p. sp.); spores allantoid, slightly curved, somewhat narrowed toward the rounded ends, hyaline, but in mass in the ascus distinctly yellowish, usually provided at each end with a single small bright refractive globule and at the center with a more or less definite transverse septum, arranged characteristically in the ascus in several longitudinal rows, each spore lying obliquely with its lower end toward the ascus wall and with its upper end toward the interior, 6–11 x 1.5–2 μ (mostly 8–9 x 1.5 μ).

Apparently cosmopolitan in distribution. Known from North America, South America, and Europe. Collected on *Rhamnus,*

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Aesculus, Buxus, Lonicera, Rubus, Alnus, Eucalyptus, Myrica, Morus, Quercus, Pinus, and other plants.

Although the type material and original description of *Sphaeria rasa* Berkeley have been studied the writer is still in doubt as to the identity of this species. It is included in the above synonymy chiefly on the basis of Berlese's figures.

MATERIAL EXAMINED

Berkeley Herb., Kew. (*type* material of *Sph. subconnata,* 2737 ex Rav. Herb); (*type* material of *Gibbera moricarpa,* 2471, 2540 ex. Rav. Herb.); (*type* material of *Sph. brevibarbata,* 1558, 1803 ex. Rav. Herb.).

Curtis Herb., Harvard Univ. (1413, *co-type* material of *Sph. pauridia*).

Saccardo Herb., in Herb. R. Horti Patavini (specimen collected in Italy on *Rubus* in 1878 and identified by Saccardo as *Fracchiaea heterogenea*).

Ellis Herb., N. Y. Bot. Gard. (specimen ex Herb. A. P. Morgan 1210, collected in Ohio by Morgan and labelled *Fr. brevibarbata*); (specimen ex Herb. Ravenel, collected by Ravenel at Darien, Georgia, on *Myrica* and apparently *co-type* material of *Gibbera moricarpa*) (137 collected at Malaga, New Jersey on *Morus* and apparently *co-type* material of *Fr. americana:* published by Cooke and Ellis as *Sph. botryosa*).

Billings Herb., N. Y. Bot. Gard. (specimen ex Herb. Rav., apparently same collection as Rav. Fung. Car. **4**: 57, labelled *Sph. subcongregata*).

Patouillard Herb., Paris, *type* material of *Fr. glomerata.*

v. Höhnel Herb. Harvard Univ. (specimen labelled *Fr. heterogenea* v. *aculeata* v. Höhnel) (five prepared slides labelled "*Fr. heterogena* Sacc. orig. ex. Myc. Ven. 88." This seems to be an erroneous citation).

Spegazzini Herb., Argentina (*type* material of *Fr. cucurbitarioides* on *Erythrine*); (*type* material *Fr. cucurbitarioides* f. *Pini-insignis* on *Pinus insignis*); (type material of *Fr. cucurbitarioides* f. *Quercus-sessiliflorae* on *Quercus-sessiliflora*); (type material of *Fr. cucurbitarioides* f. *Cecropiicoli* on *Cecropos adenopus*).

Fitzpatrick Herb., Cornell Univ. (1901 collected by R. Thaxter in Argentina on *Eucalyptus*: material of same deposited in Herb. Thaxter, Cambridge, Mass.).

Spegazzini, Dec. Myc. Argentinae 41, distributed as *Fr. heterogenea* and later made the basis of *Fr. eucalyptina* (at N. Y. Bot. Gard., Harvard Univ., Bur. Plant Industry, and in Saccardo Herb.).

Cavara, Longobardiae Exsiccati 119, labelled *Fr. heterogenea* (at N. Y. Bot. Gard., Harvard Univ., and Bur. Plant Industry).

Ravenel Fungi Car. **4**: 57, distributed as the original material of *Sphaeria subcongregata* (at N. Y. Bot. Gard., Harvard Univ., Cornell Univ., Bur. Plant Industry, and Herb. Berkeley).

Langlois, Flora Ludoviciana 2469, distributed as *Fr. subcongregata* (at N. Y. Bot. Gard., and Bur. Plant Industry).

Herb. U. S. North Pacific Exploring Expedition under Commanders Ringgold and Rogers 1853–56, material collected by C. Wright in Nicaragua and determined by Ellis as *Sph. subcongregata* (at Harvard Univ., and Bur. Plant Industry).

Ellis, North Amer. Fung. 692, labelled *Gibbera moricarpa* (at N. Y. Bot. Gard., and Cornell Univ.).

Ravenel, Fungi Amer. 343, labelled *G. moricarpa* (at N. Y. Bot. Gard., Harvard Univ., Bur. Plant Industry, and Cornell Univ.).

DOUBTFUL AND EXCLUDED FORMS

As several of the species included under this heading are referred to genera of the Coronophoraceae a few remarks concerning this family should be incorporated here. The genera (*Coronophora* and *Cryptosphaerella* were first shown by von Höhnel (**14**, **15**) to differ essentially from the Calosphaeriaceae. He founded the family Coronophoraceae to include these two genera and later incorporated a new genus *Coronophorella*. The group as characterized by him includes forms in which a true ostiolum is lacking, the nucleus of asci being forcibly discharged as a whole through the perithecial wall so that a large irregular opening remains. In *Cryptosphaerella* (polysporous) and *Coronophorella* (8-spored) this discharge follows the appearance within the perithecium of a prominent intrusion of gelatinized cells which hangs

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as an inverted cone from the apex of the perithecium. This cone, evident in these genera, has not been observed in *Coronophora*. The genus *Fracchiaea* is regarded by v. Höhnel (**18, 19**) as closely related to these genera; differing from *Coronophora* according to him chiefly in the definite ascospore arrangement and in the possession of non-stipitate asci. He finds in the perithecium a typical ostiolar formation in the inner wall consisting of a circle of periphyses but fails to find a perforation through the outer wall. A conical intrusion of gelatinized cells is absent. This intrusion has been discovered by the writer in the perithecia of several species hitherto included in *Fracchiaea*. These species are here tentatively referred to *Cryptosphaerella*. Further work designed to elucidate their taxonomic relationships is in progress.

1. FRACCHIAEA CALLISTA (Berk. & Curt.) Sacc., Syll. Fung. **1**: 94. 1882.

Cucurbitaria callista Berk. & Curt., Grevillea **4**: 47. 1876.
Sphaeria callista Berk. & Curt. nom. nud. in Rav. Fung. Carol. **5**: 67. 1860.

Examination of the type material and other authentic specimens of this species reveals the presence of the above mentioned gelatinous intrusion and the absence of an ostiolum. The fungus showing the wide opening in the perithecial wall resulting from the forcible discharge of the nucleus is well illustrated in plate 10, figure 6. The species is a member of the Coronophoraceae and is here referred to *Cryptosphaerella*.

2. FRACCHIAEA AFFINIS Sydow, in Emile Wildeman, Flore Bas-Moy Congo **3**: 16. 1909.

Examination of type material from the herbarium of Sydow shows that in this species also an ostiolum is absent, and longitudinal sections reveal the presence of the conical gelatinous intrusion. The species is therefore referred to *Cryptosphaerella*.

3. FRACCHIAEA AUSTRALIS Spegazzini, in herb.

Study of the type material of this species shows it also to belong to *Cryptosphaerella*. A longitudinal section of the perithecium containing the gelatinous intrusion is shown in figure 5.

4. FRACCHIAEA ROMELLIANA Berlese, Icones Fungorum **3**: 26. *pl.* 32. *fig.* 3. 1900.

Coronophora gregaria (Lib.) Fuckel, in Herb. Romell.

Examination of type material from the herbarium of Berlese reveals the conical intrusion and the species is here referred to *Cryptosphaerella.*

5. FRACCHIAEA (?) MULTIASCA Patouillard, Bul. Soc. Mycol. Fr. **4**: 106. 1888.

An attempt was made to obtain type material of this species for study, but Professor Patouillard was unable to find the specimen in his herbarium. Apparently it has been lost. Since in the description of the species the contents of the perithecium are described as escaping as a whole, and since the perithecium is said to be astomous, we may suggest the probability that this species also is referable to *Cryptosphaerella.*

6. FRACCHIAEA ROSTRATA Delacroix, Bul. Soc. Mycol. Fr. **9**: 266. 1893.

Examination of type material, made available through the courtesy of Professor Patouillard, shows this species to differ very strikingly from *Fracchiaea.* The perithecium is prominently beaked, and the ascus contains a relatively small number of spores, probably 32, irregularly arranged. The characters of the species correspond in general to those figured by Berlese (**4**) for *Coronophora,* but it is not a member of this genus in the sense of von Höhnel (**15, 17**) and Petrak (**25**). The writer is inclined to refer it to *Valsella.*

7. FRACCHIAEA MICROSPORA Sacc. & Bresadola, Malpighia **13**: 437. 1899.

Examination of a portion of the type specimen of this species received from the herbarium of Saccardo reveals that the species is in fact a discomycete. Although the fruit-body has a superficial resemblance to a perithecium, thin sections reveal its true character. The paraphyses are very abundant, protrude beyond the asci, and at their tips are fused in a brown matrix forming an epithecium which is concolorous with the surface of the excipulum.

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8. FRACCHIAEA INTROFLEXA Berk. & Rav. nom. nud. in Cooke, Grevillea **15**: 84. 1887.

Sphaeria introflexa Berk. & Rav. nom. nud. in herb. Curtis.

This species is merely *Tympanopsis euomphala* (Berk. & Curt.) Starbäck included by the writer (**12**) in the Nitschkieae.
kieae.

9. FRACCHIAEA CANDOLLEI (Tulasne) Cooke, Grevillea **15**: 84. 1887.

Pleurostoma Candollei Tulasne, Sel. Carpol. Fung. **2**: 247. *pl. 2. fig. 1–3.* 1863.

Cooke was in error in assuming that this species should be incorporated in *Fracchiaea.* It is a peculiar form of doubtful affinities. It was included by Lindau (**21**) in the Diatrypaceae. Berlese (**4**) supplies figures made from the type material, and apparently regards the species as related to *Neoarcangelia.* The writer has examined specimens in the herbarium of von Höhnel, and finds the species to be very unlike *Fracchiaea.*

10. SPHAERIA POLYCOCCA Berk. & Rav. nom. nud. in Rav. Fung. Carol. **4**: 62. 1855.

This species is cited by Cooke (**6**) as equivalent to *Fracchiaea heterogenea* Sacc. Examination of three copies of this exsiccati (at Harvard Univ., N. Y. Bot. Gard., and Bur. Pl. Industry) shows the fungus present to be a *Eutypella.*

11. FRACCHIAEA CORDAEANA Schulzer & Sacc., Hedwigia **23**: 42. 1884, and Rev. Mycol. **6**: 68–69. 1884.

Synsphaeria parallela Schulzer, Verh. Zool.-Bot. Gesell. Wien. **21**: 1244. 1871.

12. FRACCHIAEA SACCARDIANA Schulz., in Schulz. & Sacc., Hedwigia **23**: 42. 1884, and Rev. Mycol. **6**: 69. 1884.

Synsphaeria parallela f. *acanthostigmoides* Schulzer, Verh. Zool.-Bot. Gesell. Wien. **21**: 1245. 1871.

Material of *Sphaeria parallela* Fries (**13**) was distributed by Fries (Scler. Suec. 3). Nitschke (**22**) examined three specimens of this in European herbaria, and compared them with other ma-

terial of the species identified by Fries. He found that the fungus has 8-spored asci, and brown, often 1-septate ascospores. He included it in *Valsa*. It was later placed in *Endoxyla* by Saccardo (**28**). The fungus has also been studied by the writer [5] and his findings agree with those of Nitschke. It is certainly not a *Fracchiaea*.

The fungi studied by Schulzer (**30**) from Slavonia, and described by him as *Synsphaeria parallela* and *Synsph. parallela* f. *acanthostigmoides* could not have been, as he thought, equivalent to *Sphaeria parallela* Fries, since he describes the asci as polysporous and the spores as hyaline and unicellular. This fact was later recognized, and the two fungi were redescribed by Schulzer and Saccardo (**31**) as *Fracchiaea Cordaeana* and *Fr. Saccardiana* respectively.

The writer has attempted to obtain authentic material of these species for study, but has been unsuccessful. They are not represented in the herbarium of Saccardo. In the library of the Hungarian Academy of Sciences at Budapest a voluminous, abundantly illustrated manuscript by Schulzer entitled "Schwämme und Pilze aus Ungarn und Slavonien" is preserved in five folio volumes, but is not accompanied by the specimens. The writer has been unable to learn whether these are still in existence. Moreover, a letter from Dr. G. Moesz, Director of the Department of Botany of the Academy, states that neither *Fr. Cordaeana* nor *Fr. Saccardiana* is mentioned or figured in the manuscript. Our knowledge of these species is limited, therefore, to the published descriptions cited above and the very inadequate figures which accompany them. As we cannot be sure that the forms are members of the genus it seems best to exclude them.

13. FRACCHIAEA HETEROGENEA f. ALNI Cavara, nom. nud. Fungi. Longobar. Exs. 234.

No material resembling *Fracchiaea* has been found by the writer in an examination of several copies of this exsiccati number. According to Berlese (**4**) and v. Höhnel (**19**) the fungus distributed is *Ditopella fusispora*.

[5] Scler. Suec. 3, at Harvard Univ. and Bur. Plant Industry.

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14. FRACCHIAEA HETEROGENEA f. SALICIS Sacc., in Berlese, Icon. Fung. **3**: 26–27. *pl. 34. fig. 1.* 1900.

Berlese does not figure the ascus and spores, and his drawing of the perithecia and very brief description leave us in doubt as to the identity of this form.

15. SPHAERIA BOTRYOSA Fries, Syst. Mycol. **2**: 342. 1823.

This species is included by Ellis (**11**) in his synonymy of *Fr. subcongregata*. An examination of material distributed by Fries (Scl. Suec. 122, at Harvard Univ.) shows a wholly different fungus.

16. FRACCHIAEA CONIFERARUM v. Höhnel, Sitzungsber. K. Akad. Wiss. Wien **118**: 843–844. 1909.

The type material of this species (dried specimen and microscopic preparations) has been studied by the writer in the von Höhnel herbarium at Harvard University. The perithecia are definitely cupulate at maturity, a gelatinous intrusion is absent, and an ostiolum has not been demonstrated. The ascospores are not definitely arranged (i.e. "dachförmig gelagerten" acc. von Höhnel) and the asci are often long- and delicately-stipitate. The species is here excluded from *Fracchiaea* because of the shape of the perithecium which lacks entirely the turbinate form characteristic of the Nitschkieae and has a wall of approximately uniform diameter above and below. A stromatic tissue is absent. The species seems to be more closely allied to *Coronophora* than to *Fracchiaea*.

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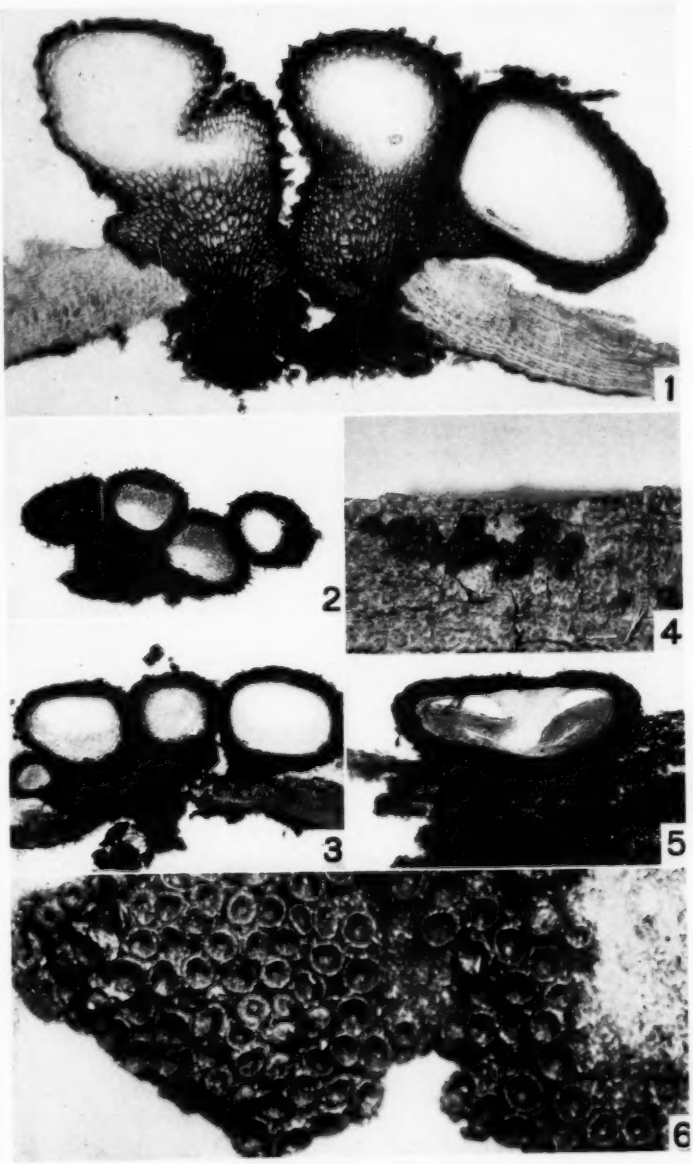
EXPLANATION OF PLATES

The magnifications given refer to the figures as reproduced. Leitz apochromatic objectives and compensating oculars were used. The photographs were taken by Mr. W. R. Fisher of the Department of Plant Pathology at Cornell University.

PLATE 10

Fig. 1. *Fracchiaea heterogenea.* Perithecia in longitudinal section. × 84. Material from Rav. F. Amer. 343 (= *Gibbera moricarpa*).

Fig. 2. *Fr. heterogenea.* Perithecia in longitudinal section. × 42. Material from Langlois Flora Ludoviciana 2469 (= *Fr. subcongregata*).



1–4. FRACCHIAEA HETEROGENEA
5. FRACCHIAEA AUSTRALIS
6. FRACCHIAEA CALLISTA

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Fig. 3. *Fr. heterogenea.* Perithecia in longitudinal section. ×42. Material from Spegazzini Myc. Argentinae 41 (=*Fr. eucalyptina*).

Fig. 4. *Fr. heterogenea.* Perithecia. ×6. Material from Langlois Flora Ludoviciana 2469 (=*Fr. subcongregata*).

Fig. 5. *Fr. australis.* Perithecium in longitudinal section showing conical gelatinous intrusion characteristic of *Coronophorella* and *Cryptosphaerella.* ×42. Type material.

Fig. 6. *Fr. callista.* Perithecia. ×16. Type material.

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A COLLECTION OF COSTA RICAN FUNGI

SILENCE ROWLEE

(WITH PLATES 11 AND 12)

The fungi here listed were collected by W. W. Rowlee and H. E. Stork in Costa Rica during July and August of 1920. The collection consists of specimens picked up during a trip in the northern part of Costa Rica, the Limon District. The majority of them are from the hot, humid, lowland zone, but a few are from the more temperate Alpine zone. The dried specimens are accompanied by detailed field notes and unusually good photographs made by Mr. Stork from the fresh material.

The writer wishes to express her indebtedness to Dr. V. C. Dunlap, Dr. W. A. Murrill, Dr. F. J. Seaver, and Dr. E. A. Burt for their kind assistance in determining material.

CHLOROPHYLLUM MOLYBDITES Mass.

The entire plant is white, being large and conspicuous in grassy places and having the general appearance of an Amanita but without a volva. The upper surface of the pileus is fibrillosely scaly, the scales brownish and adhering in a disc. The pileus is 12 cm. in diameter. The spores are of a characteristic flax-seed like form with one large guttulum and are apiculate at the point of attachment, 7–8 x 10–12 μ, decidedly green in color.

The natives of Costa Rica told Dr. Stork that it was good to eat but not as good as "the good mushroom that grows on trees."

La Junta, Costa Rica, 1920. *No. 528.*

LENTODIELLUM CONCAVUM (Berk.) Murrill

Plants entirely white, tough, growing in clumps or closely cespitose on dead fallen logs in clearing. Conspicuous, all united at the base. Pileus deeply infundibuliform, glabrous, reaching 7 cm. in diameter.

Santo Domingo and throughout tropical America.

This material was collected at Guacimo, Costa Rica. *No. 557.*

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LENTINUS SUBSCYPHOIDES Murrill

Plant gregarious on dead logs. Pileus funnel-shaped, thin, 1–2 cm. in diameter, glabrous, smooth, dark brown in center becoming mouse colored toward the margin.

Jamaica, Martinique, Porto Rico, and British Honduras.

Collected by Stork near La Junta, Costa Rica, July 17, 1920. *No. 525.*

LENTINUS STRIGOSUS (Schw.) Fries

Plant tough, leathery, almost funnel-shaped, 4 cm. high, upper surface of pileus yellowish brown, darker when young, with tufts of dark brown fibrils close together.

Cosmopolitan.

La America Farm, Costa Rica, *No. 569.* Very common in Costa Rica on dead wood.

LENTINUS CRINITUS (L.) Fries

Plant tough, cartilaginous, depressed to infundibuliform, entire plant yellowish-brown, lacking entirely the reddish tinge of *L. strigosus* but otherwise very much like it. Surface of pileus densely covered with stiff, squamose, dark, fuscous hairs.

Throughout the tropics and in certain states bordering on the Gulf of Mexico.

From decaying sticks beneath the surface of the soil, La America Farm. *No. 523.*

HEXAGONA FLORIDANA Murrill

Plant growing in great profusion on a large capulcine tree and much infected with a small fly. Has at first a gelatinous appearance but is of firm consistency. Pileus flabelliform, applanate. Surface white, glabrous, somewhat hygrophanous.

Previously known only from type locality, Miami, Florida.

Collected in 1920 near La Junta, Costa Rica. *No. 567.*

HEXAGONA PURPURASCENS (Berk. & Curt.) Murrill

Pileus spathulate, surface wine-colored, glabrous.

Known only from Cuba.

Collected near La Junta, Costa Rica. *No. 538.*

POLYPORUS DIABOLICUS Berk.

Pileus circular, slightly umbilicate, surface brownish-black, slightly radiate-striate, glabrous.

Mexico and Central America as well as South America.

One half mile from La Junta, Cost Rica, on the bank of the Reventazon. *No. 566.*

POGONOMYCES HYDNOIDES (Schw.) Murrill

Pileus dimidiate, sessile, often conchate. Surface bay to nearly black, covered with very long, rather distant, black, branched, fibrillose hairs.

Common throughout the tropics.

On dead logs in the forest at La Junta, Costa Rica. *No. 558.*

CORIOLUS PROLIFICANS (Fries) Murrill

Pileus very variable, mostly sessile, dimidiate to flabelliform. Surface tomentose, pallid to yellowish, slightly zoned.

Common on dead wood throughout the tropics.

Stork collected this on fallen trees on Irazu Volcano. *No. 556.*

CORIOLOPSIS OCCIDENTALIS (Klotzsch) Murrill

Pileus leathery to corky, dimidiate, applanate. Surface concentrically zoned, tomentose, grayish-ochraceous to grayish-isabelline.

Common on dead wood in tropics.

Very common on dead logs, near La Junta, Costa Rica. *No. 531.*

RIGIDOPORUS SURINAMENSIS (Miq.) Murrill

Plant very variable, dimidiate or reniform, nearly conchate, applanate or with very short, lateral, stipe-like attachment. Surface rugose, pruinose to glabrous, multi-concentrically zonate, isabelline to latericeous.

Commonly found on water soaked hardwood trees throughout the tropics.

On decayed wood near La Junta, Costa Rica. *No. 560–571.*

PYCNOPORUS SANGUINEUS (L.) Murrill

Common on dead wood throughout the tropics.

Collected near La Junta, Costa Rica. *No. 545.*

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ELFVINGIA TORNATA (Pers.) Murrill

Surface brown to almost black, sulcate, horny-encrusted, with suggestion of blackish bands.

Common in the tropics on decayed wood.

Stork found it on dead roots near Livingston, Costa Rica. *No. 564.*

GANODERMA SUBFORNICATUM Murrill

Surface glabrous, rugose, concentrically sulcate, laccate, subshining.

Occasional in British Honduras.

Near the Reventazon river, one half mile from La Junta, Costa Rica. *No. 563.*

GANODERMA SUBINCRUSTATUM Murrill

Surface glabrous, sulcate, zonate, bay to dark brown.

British Honduras and in Jamaica.

Collected by Stork from dead roots, La Junta, Costa Rica, August 20, 1920. *Nos. 526, 559.*

DAEDALEA AMANITOIDES Beauv.

Common throughout tropics.

From dead wood, near La Junta, Costa Rica. *Nos. 530, 570.*

HYDNUM DISCOLOR Fries

Plant large, sponge-like, base broad, spongy, sterile. Top flattened, covered with spines, which are usually round or occasionally flattened, rarely fused. Closely crowded spines about 15 cm. to one half mm. in diameter and pointed at end. Hair-like hyphae covering surface of spines, especially at tips. Spores globose, thick walled, average 4 μ. Entire plant white, becoming yellow with age. Weight 1 pound or more.

On half dead trunks in Jamaica and Central America.

Collected on Irazu Volcano, elevation of 9000 feet. *No. 599.*

HYDNUM GUARANITICUM Speg.

Entire plant light tawny, hygrophanous, glabrous, with thin flesh and extremely thin margin, smaller spines extending to edge. Pileus 3–4 cm. diameter, coriaceous to membranaceous, 0.4–0.5

mm. thick. Spines crowded, concolorous, 0.5–0.7 mm. long, 0.1 mm. at greatest diameter, tapering to sharp point. Spores nearly spherical, hyaline, 4 μ.

In woods on trunks of trees throughout Paraguay.

From roots in a moist bank in a deep shaded ravine. Tuccurique, Costa Rica. *No. 568.*

HYMENOCHAETE DAMAECORNIS (Link) Lév.

Irregularly stipitate, glabrous, leathery. Pileus striate, erect, margin irregularly lobed. Upper surface velvety, golden-brown. Under surface smooth, darker brown with lighter margin. Spores round, 4 mm. in diameter.

Collected on the trail west of Squirres, Central America.

STEREUM DECOLORANS Berk. & Curt.

Entire plant white. Pileus cyathiform, faintly zoned, linearly striate. Stipe tomentose, hymenium glabrous, spores immature. Dr. Burt said: "This specimen is like *S. decolorans* in general aspect, color, and structure, but with the pileus more cut up than the West Indian gatherings. Have never seen anything like this exactly."

On trees in the woods of Cuba, Central America, Australia.

Collected on the old Spanish trail west of Squirres, from an old decaying stump.

STEREUM AUSTRALE Lloyd

Resupinate, round, 10–15 μ in diameter, slightly umbilicate. Fruiting surface golden yellow.

Argentina and Spanish America.

Collected on old Spanish trail west of Squirres.

AURICULARIA AURICULA (L.) Underw.

Concave, flabby but not sticky, dark, livid, almost black when dried.

Common in all parts of world.

Very common where Stork collected it on dead wood near Livingston, Costa Rica. *No. 547.*

GUEPINIA FISSA Berk.

Caespitose. Pileus fissured, narrowly spathulate, lobes becoming linearly striate at maturity. Hymenium pallid and subshining.

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Stipe elongate, laterally compressed, velvety at base.

All through the tropical world.

Stork collected it at La America Farm. *No. 521.*

DALDINIA CONCENTRICA (Bolt.) Ces. & DeNot.

This plant is so common that it is hardly necessary to describe it. It is common on *Fraxinus, Alnus, Betula, Juglans, Acer, Corylus, Salix, Ulmus, Fagus,* etc.

In all Europe, Siberia, North and South America, India, Ceylon, Borneo, Tasmania, New Zealand, and Java.

Stork collected it near Sizuirres, Costa Rica, on decaying cross ties. *No. 561.*

DALDINIA sp.

This is different from *D. concentrica.* It is effused and forms a hard knobby mass, the surface of which is grayish black. The ostiola of the perithecia are visible to the unaided eye. In a cross section the concentric lines evident in *D. concentrica* are not visible. This specimen agrees perfectly with an unnamed specimen collected by Dr. W. A. Murrill in Mexico.

Collected at the Laguna near Irazu Volcano. *No. 548.*

XYLARIA POLYMORPHA Pers.

Plants black to dark bay, variable, caespitose or rarely solitary.

Very common and cosmopolitan.

Collected near La Junta, Costa Rica, where it was common on decaying logs. *No. 540.*

XYLARIA POCULIFORMIS Mont.

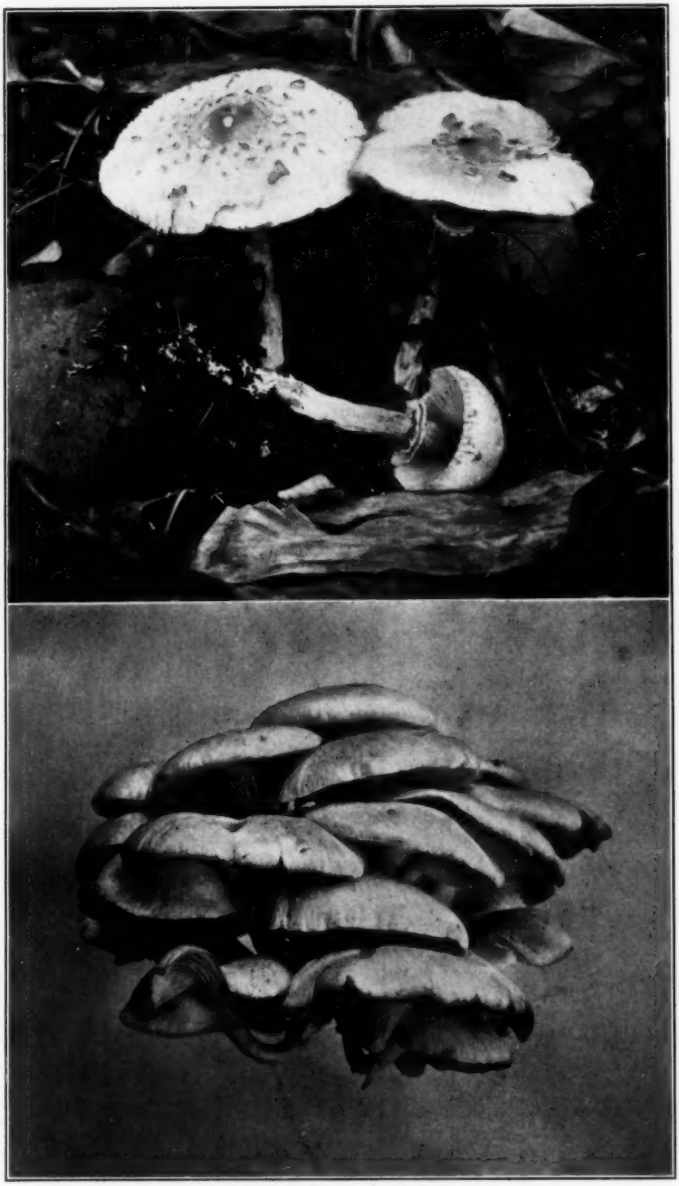
Solitary, obovate to poculiform, globose. Black to grayish-black, dull, with very short thick stipe. Perithecia few, scattered. ostiola concealed.

Mexico.

Near La Junta, on a large decaying log. *No. 541.*

COOKEINA SULCIPES (Berk.) O. Kuntze

Plants stipitate, cup-shaped, 1–2 cm. in diameter by 1 cm. deep. Exterior of cup marked at the margin by several concentric rings and with a fringe of very short subconical hairs which are more



1. CHLOROPHYLLUM MOLYBDITES
2. LENTODIELLUM CONCAVUM

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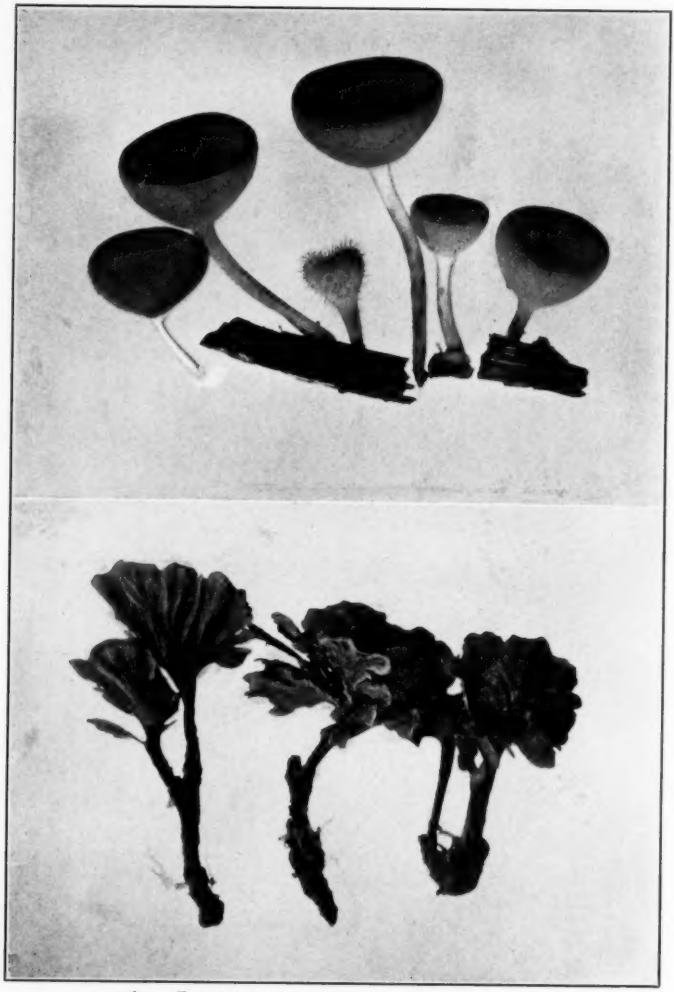

1a. COOKEINA SULCIPES
1b. COOKEINA TRICHOLOMA (hairy specimen)
2. HYMENOCHAETE DAMAECORNIS

numerous at the margin. Plant flesh colored to nearly scarlet, paler outside than within. Stipe up to 3 cm. by 2 mm. Spores biguttulate, 12–15 x 25–30 μ.

West Indies, Mexico south to South America and Australia.

On dead sticks in deep forest at La Junta, Costa Rica. *No. 532.*

NECTRIA TUCUMANENSIS Speg.

Perithecia 1/3 mm. in diameter, cup-shaped to globose, crowded together in groups (some with as many as twenty), erumpent. Outer wall whitish, scaly fringe about deep flesh-colored center, spores very large reaching 12 x 40 μ, ellipsoid or slightly curved.

Previously collected only in Argentina.

Collected by Stork near Cairo, Costa Rica, on bark of unknown tree. *No. 539.*

EXPLANATION OF PLATES

PLATE 11

Fig. 1. *Chlorophyllum Molybdites* Mass.
Fig. 2. *Lentodiellum concavum* (Berk.) Murrill.

PLATE 12

Fig. 1. *Cookeina sulcipes* (Berk.) O. Kuntze. The immature hairy specimen is *Cookeina Tricholoma.*
Fig. 2. *Hymenochaete damaecornis* (Link) Lév.

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FUNGI FROM CENTRAL MANITOBA

G. R. Bisby

"Norway House" is the name applied specifically to a post of the Hudson's Bay Co., and generally to an area on or near 54° north latitude and about 97° 50′ west of Greenwich. This region is along the Nelson River just north of Lake Winnipeg, and is some 350 miles north of the International Boundary, and about 300 miles from Hudson's Bay. It is near the geographical center of Manitoba, about the center of Canada in an east and west direction, and is approximately half way between a parallel passing through Pittsburgh and Lincoln, and the Arctic Circle. Norway House lies just within the geologically ancient Laurentian Plateau, and the Pre-cambrian rock is either exposed or lightly covered with soil. At first glance the plants and the rock formation resemble those found near the Lake of the Woods and north of Lake Superior. The trees are, however, somewhat smaller than they are three hundred miles southeast, and various species of plants found near the Lake of the Woods are missing from the Norway House region. Black spruce, jack pine, larch, poplars, birches, willows, and *Prunus* spp. are the common trees. Lowe[1] has listed the higher plants of an area a few miles from Norway House.

Norway House is within an enormous area of central Canada in which few surveys for fungi have been made. The fungi of southern Canada and the northern United States are moderately well known, and the fungi of the Arctic regions, including Alaska, Greenland, and the northern coast of Canada, have also received considerable attention.[2]

The nearest agricultural area is the Swan River Valley some 200 miles from Norway House, and the latter region is not much affected by civilization, although some potatoes, vegetables, sunflow-

[1] Lowe, C. W., The Flora of Warren's Landing, Lake Winnipeg, Man., Canadian Field-Nat. **34**: 26–30, 1920.

[2] See Dearness, John, Report of the Canadian Arctic Expedition 1913–1918, Vol. IV, part C, pp. 1c–24c, 1923, for list of fungi and for references.

ers, timothy, and oats are grown, and these plants yielded certain of the fungi reported here.

The writer submitted various specimens to specialists, both in order to obtain accurate determinations, and in order to place specimens in herbaria where they would be useful as indicating the range of fungi. The names of those to whom fungi were sent are indicated below; to all of them the writer is grateful, and also to Professor V. W. Jackson for certain host determinations, and to Dr. A. H. R. Buller for examining certain fungi and for other help.

Norway House, with the nearby Rossville Mission Indian School, and the new Playgreen Inn at which to stay, is a splendid spot to spend a summer holiday; especially for one interested in the fungi. The 118 species here reported were all collected in the six days from Aug. 11 to 16, 1923. The range of several species of fungi is extended considerably northward.

It is still a common practice to designate simply "Canada" in giving distribution of fungi. Since Canada is about the size of the United States and Mexico combined, and extends from a peach belt at 42° latitude nearly to the North Pole, and from the 57th to the 141st meridian, it is evident that the name of the province or other destination should be given.

MYXOMYCETES

The slime molds were not abundant. The two marked "E" were determined by Dr. W. T. Elliott, Tanworth-in-Arden, England.

Craterium leucocephalum (Pers.) Dittm., *1630* E.
Didymium squamulosum (A. and S.) Fr., *1631* E.
Enteridium Rozeanum (Rost.) Wing, *1632*.

BACTERIA

The following bacterial diseases of plants were found:

Actinomyces scabies (Thaxt.) Güssow, common on potatoes, *1437*.
Bacillus atrosepticus van Hall. An occasional potato plant was found affected.
Pseudomonas Phaseoli, E. F. Sm., common on beans, *1448*.

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PHYCOMYCETES

Rhizopus nigricans Ehr. Found on leaf mold. This was the only Phycomycete encountered. Dearness (l. c.) comments on the rarity of Phycomycetes in more arctic regions.

ASCOMYCETES

Numbers followed by "S" are identifications made by the courtesy of Dr. F. J. Seaver, New York Botanical Gardens.

Chlorosplenium aeruginosum (Oed.) De Not. on old wood, *1439.*

Claviceps purpurea (Fr.) Tul. on *Poa pratense, 1401;* on *Elymus innovatus, 1412;* on *Agropyron* sp. *1413.*

Daldinia vernicosa (Schw.) Ces. and De Not. on old wood, *1438.*

Diatrype spp. *1411* S, *1413* S.

Eleutheromyces subulatus (Tode) Fuckel, on a mushroom, *1480* S.

Erysiphe graminis D. C. on *Phleum pratense, 1427.* Perhaps it was too early for powdery mildews; only two were found.

E. polygoni D. C. on *Polygonum aviculare, 1443.*

Helotium citrinum (Hedw.) Fr. on wood, *1435.*

Hypoxylon fuscum (Pers.) Fr. *1415* S.

H. multiforme Fr. *1410* S, *1412* S.

Hysterium sp. on coniferous wood, *1405.* An interesting species with spores 4–6 by 34–43 μ. Not yet definitely determined.

Lophium mytilinellum Fr. I am placing as this species No. *1603* with hysterothecia 0.2–0.4 mm. long, and spores 1.5–2 by 90–120 μ. It was found on the bark of a coniferous tree.

Lophodermium pinastri (Schr.) Chev. on leaves of *Pinus Banksiana, 1404.*

Nectria cinnabarina (Tode) Fr. (*Tubercularia vulgaris* stage) *1414* S.

Peziza vesiculosa Bull. *1419.*

Rhytisma salicinum (Pers.) Fr. on willow leaves, *1411.*

Spathularia clavata (Schaeff.) Sacc. on old wood in mossy ground, *1408.*

FUNGI IMPERFECTI

Leaf spots were common. Numbers marked "D" were examined by Dr. J. J. Davis of Wisconsin.

Alternaria Solani (E. & M.) J. & G. on potatoes, *1418*. No spores were found but the spots were typical of early blight.

Cercospora antipus Ell. & Hol. on *Lonicera glaucescens, 1483*.

C. zebrina Pass. on *Trifolium repens, 1446*.

Cladosporium (probably *C. graminum* Corda) on *Poa pratense, 1402;* on oats, *1429*.

C. subsessile Ell. & Barth. on *Populus tremuloides, 1623*.

Cylindrosporium hiemale Higgins on *Prunus pennsylvanicus, 1444*.

C. lutescens Higgins on *Padus virginiana, 1606*.

Fusicladium radiosum (Lib.) Lindau on *Populus* leaves, *1434* D.

Phyllosticta Caricis (Fuckel) Sacc. on old leaves of *Carex vesicaria, 1628*.

Polythrincium trifolii Kze. on *Trifolium repens, 1447*.

Ramularia punctiformis (Schl.) v. Hoeh. on *Epilobium angustifolium, 1485*. The spores were found to be 18–26 by 3–4 μ, which is somewhat large for this species.

R. Taraxaci Karst. on *Leontodon Taraxacum, 1400*.

R. Tulasnei Sacc. common on leaves of *Fragaria canadensis, 1430*.

Rhizoctonia Solani Kuehn, common on potato stems and tubers, *1417*. This fungus is evidently common in this region; the *Corticium* stage was found twice on old wood.

Septoria alnifolia E. & E. on *Alnus incana, 1481*. Spores rather long, being 54–70 x 3 μ, but probably this species.

S. caricis Passer. on *Carex vesicaria, 1626*. The spores are 35–40 x 2.5 μ and fit this species, but I am not sure it occurs in North America.

S. Ribis Desm. common on *Ribes* spp. *1433*.

S. salicina Pk. (probably) on *Salix* spp. *1431* D.

Stagonospora sp. on *Carex vesicaria, 1626*.

BASIDIOMYCETES

Ustilaginales. Only the following three smuts were found at Norway House, and one of these was introduced. The smuts are rare in the arctic regions further North.

Cintractia Caricis (Pers.) Magn. on *Carex aquatilis*, common, *1406*.

Ustilago levis (K. & S.) Magn. on *Avena sativa, 1445*.

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UMI

U. Lorentziana Thuem. on *Hordeum jubatum.* Very common, *1428.*

Uredinales. The rusts are apparently rare in arctic regions, but as far south as Norway House they are evidently quite numerous.

Coleosporium Solidaginis (Schw.) Thuem. Common on *Solidago multiradiata, 1415.*

Melampsora Bigelowii Thuem. on *Salix* spp. common, *1432.*

Melampsoropsis ledicola (Peck) Arth. I common on *Picea mariana, 1604;* II on *Ledum groenlandicum, 1403.* This rust determined by W. P. Fraser.

Phragmidium Rosae-acicularis Liro, II, III on *Rosa acicularis, 1407.*

Puccinia epiphylla (L.) Wettst. II common on *Poa pratensis, 1416.*

P. gigantea P. Karst. III on *Chamaenerion angustifolium, 1605,* det. H. S. Jackson. This extends the range considerably eastward.

P. graminis Pers. Especial attention was paid to the occurrence of this rust, because of the data it would give on the spread of the urediniospores by the wind. At Beren's River, half way up Lake Winnipeg, this rust was already abundant on Aug. 9 on a small patch of oats and on *Hordeum jubatum.* At Grand Rapids on Aug. 10 no *P. graminis* could be found. At Norway House rust was common but not serious on timothy, *1424;* this form evidently overwinters there in the uredinial stage. Hundreds of *Hordeum jubatum* plants were examined before a couple of pustules of primary infection were finally found at Rossville Mission on Aug. 14, No. *1425.* Two or three pustules were found at the same date and place on a plot of oats, *1423.* The *Avenae* and the *Tritici* or *secalis* forms had apparently just reached the Norway House region in time for early infections to appear by the middle of August. The early and continuous protection of the uredinial stage in autumn and winter by snow, and the sudden spring, might appear to favor overwintering of this stage; but evidently only the timothy form lives over winter there. On the return trip, rust was found on Aug. 17 on *Hordeum jubatum* at Grand Rapids, *1397,* and in increasing quantities as we went south.

P. Grossulariae (Schum.) Lagerh. I on *Ribes* sp. *1450.*
P. Helianthi-mollis (Schw.) Jackson II, III on *Helianthus annuus* (cult.), *1426.*
P. lysimachiata (Schw.) Kern I on *Naumburgia thyrsiflora, 1409.*
P. urticata (Link) Kern on *Carex* sp. *1629.*
Pucciniastrum arcticum (Lag.) Tranz. on *Rubus triflorus, 1410.*
P. pustulatum (Pers.) Diet. on *Chamaenerion angustifolium, 1449.* Determination verified by W. P. Fraser.

Tremellales. All fungi marked "Ll" here and elsewhere were determined by Mr. C. G. Lloyd.
Exidia glandulosa (Bull.) Fr. *1442.*
Tremella lutescens Fr. *1622* Ll.
T. mesenterica Fr. *1621* Ll.

AGARICALES

THELEPHORACEAE and HYPOCHNACEAE (on old wood unless otherwise noted). All numbers marked "B" were identified by Dr. E. A. Burt.
Corticum arachnoideum Berk. *1465* B and *1466* B.
C. laetum Karst. *1460* B.
C. livido-caeruleum Karst. *1462* B.
C. vagum B. and C. *1475* B, *1477* B.
Hypochnus cervinus Burt. *1457* B.
H. fumosus Fr. *1459* B.
Peniophora glebulosa Bres. *1458* B, *1476* B.
P. subalutacea Karst. *1464* B.
Stereum fasciatum Schw., *1451* B.
S. rufum Fr. common on fallen poplar branches, *1436* B.
S. ochraceoflavum Schw., det. by C. H. Kauffman.
S. rugosiusculum B. & C. *1452* B. According to F. T. Brooks, the same as *S. purpureum.*
Thelephora caryophyllea (Schaeff.) Fr. *1454* B.
T. intybacea (Pers.) Fr. *1455* B.
T. terrestris (Ehrh.) Fr. *1453* B, *1470* B.
Clavariaceae: Clavaria ligula Schaeff. *1468* B.
C. pulchra Pk. on ground, *1469* B.
C. stricta Pers. on decaying wood, *1474* B.

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Hydnaceae: Hydnum caeruleum Fl. Dan. *1471* B.
H. connatum Schultz (*H. cyathiforme* Schaeff.) *1473* B.
H. mirabile Fr. (probably) *1472* B.
H. repandum Fr. Found but not preserved.
Odontia spp. *1494* V, *1463* B.

POLYPORACEAE. Dr. L. O. Overholts reported on those fungi marked "V."

Daedalea unicolor Bull. *1486* V, *1499* V.
Favolus canadensis Klotz, *1420* V.
Fomes fomentarius (L.) Gill. *1491* V.
Lenzites betulina Fr. *1495* V.
L. saepiaria Fr. *1496* V, *1497* V.
Merulius niveus Fr. *1461* B.
M. pilosus Burt. *1456* B, *1467* B.
Polyporus betulinus Bull. *1421* V, *1422*.
P. biformis Kl. *1490* V.
P. caesius Fr. *1492* V.
P. pargamenus Fr. *1489* V.
P. pubescens Schum. (or possibly var. *Grayii* according to Dr. Overholts), *1487* V.
P. tulipiferus (Schw.) Overh. (probably) *1498* V.
Trametes carnea Nees, *1600* V.
T. hispida (Bagl.) Fr. *1601* V.

BOLETACEAE. *Boletus scaber* Fr. occurred commonly, and also half a dozen other species which I could not identify with certainty.

AGARICACEAE. Gill fungi were abundant at Norway House during my stay there, since I chanced to strike a period of fine weather following rains. I had neither time nor facilities, however, to handle them, and could only dry a few of them, and Dr. Kauffman kindly looked these over; he reported those marked here with "K" as being forms of which he felt sure of the identification. Those not marked were identified by the writer in the field.

Cantharellus aurantiacus Fr. K.
C. umbonatus Fr. K.
Clitocybe laccata Quél. K.
Coprinus micaceus Fr.

Cortinarius calochrous Fr. K.
Crepidotus herbarum Pk. K.
Flammula sapinea Fr. K.
Inocybe minima Pk. K.
Lactarius parvus Pk. K.
L. torminosus Fr. K.
Naucoria pediades Fr.
Panaeolus solidipes Pk.
Russula chamaeolentinus Fr. K.
R. emetica Fr.
R. graminicolor Quél. K.

LYCOPERDALES

Lycoperdon cepaeforme Bull. (?) *1609* Ll.
L. spadiceum Pers. (?) *1607* Ll.

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NOTES AND BRIEF ARTICLES

[Unsigned notes are by the editor]

The caption under plate 7 of the March issue of MYCOLOGIA should be corrected to read, " Phyllachora graminis on Agropyron repens."

Dr. Arthur S. Rhoads, pathologist of the Missouri State Fruit Experiment Station, has accepted the position of Assistant Plant Pathologist of the Florida Agricultural Experiment Station.

Snapdragon rust, according to Butler, of the New Hampshire Agricultural Experiment Station, can not be controlled in the field either with sulphur or with the copper fungicides. This conclusion is based on field experiments.

A new enemy of the cocoa, *Trachysphaera fructigena,* causing the disease known as " mealy pod," has been described by R. H. Bunting in the *Gold Coast Journal.* For the control of this downy mildew, it is necessary to bury all diseased pods and all husks from which the seeds have been removed, thus preventing the distribution of the spores.

Dr. Sanford M. Zeller, of the Oregon Agricultural College, visited the Garden during the Christmas holidays to examine specimens of underground puffballs (Hymenogasters). Very few of these fungi occur in the eastern United States, but they are quite frequent on the Pacific coast, especially in California.

An excellent set of seventy sample specimens of species of *Clavaria,* the principal genus of the coral-fungi, has recently been sent to the Garden herbarium by Professor W. C. Coker, of the University of North Carolina, who is the author of the latest book on this

interesting family of fungi. These specimens will be very valuable for determining new material in this group.

Dr. C. F. Millspaugh, who died last September, was much interested in fungi although his chief work was with flowering plants. He was born in Ithaca, N. Y., about seventy years ago; practised medicine several years at Binghamton; and became curator of the department of botany in the Field Museum of Chicago in 1894, which position he held until his death. Much of his time was devoted to botanical exploration in tropical America.

The Higher Fungi of the Hawaiian Islands, by Dr. E. A. Burt, appeared in the *Annals of the Missouri Botanical Garden* for April, 1923. The paper treats of collections made by F. L. Stevens, C. N. Forbes, and others, comprising 61 species, about half of which are polypores. The author concludes that very few North American species of the higher fungi occur in Hawaii. *Crepidotus rhizomorphus, Fomes fasciculatus, Corticium granulare,* and *Epithele hydnoides* are described by Dr. Burt as new.

A systematic presentation of new genera of fungi published since volume 22 of Saccardo's "Sylloge" appeared was printed in the *Transactions of the American Microscopical Society* for January, 1923. The authors, O. A. Plunkett, P. A. Young, and Ruth W. Ryan, of the University of Illinois, catalogued about 7,000 new species of fungi described since 1910 in the preparation of this valuable paper. The new generic names are tabulated in the main according to the Engler and Prantl system.

Diseases of ornamental and forest trees are discussed by C. J. Humphrey in the annual report of the Wisconsin State Horticultural Society for 1922. Important tree fungi like *Rhytisma acerinum, Sphaeropsis ulmicola,* and *Armillaria mellea* are given considerable attention. Shellac is recommended for small wounds and for larger ones a 50:50 mixture of coal-tar creosote and as-

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phaltum, except in case of delicate trees like the peach, magnolia, and tulip, where the asphaltum should be increased to 75 per cent.

A brief sketch of the life and work of Dr. Elias J. Durand with a photograph and a list of his publications, prepared by Prof. R. B. Harvey, appeared in *Phytopathology* for September, 1923. He was born at Canandaigua, New York; was educated at Cornell University and taught botany there from 1893 to 1910; and was called to the University of Missouri and then to the University of Minnesota, where he died in the fall of 1922. Dr. Durand was a born teacher and much loved by his pupils. His mycological work was mainly with the discomycetes. His herbarium, containing over 12,000 specimens of this group of fungi, is now at Cornell.

The season of 1923 was notably a poor one for fungi about New York City owing to the unprecedented drought, which prevented the mycelium from developing. The late rains, which usually bring out a large crop of mushrooms, were practically without effect this year. East of Conservatory Range 1, where there are usually quantities of *Boletus luteus* under the pines, I counted only half a dozen fruit-bodies. Several scattered specimens of *Agaricus campester* were picked up on the lawns in October, but the crop was soon exhausted. *Hypholoma perplexum* and *Armillaria mellea* were also scarce early in November and I noticed only a single specimen of the oyster mushroom. A cluster of *Pholiota squarrosa* was found on a white willow trunk by the Bronx River in North Meadows on October 12, which recalled a similar specimen collected on willow south of Upsala, Sweden, several years ago. *Collybia velutipes* was frequent on elm logs and stumps, being greedily eaten by gray squirrels. *Pleurotus ulmarius* was common on elms all about the city toward the latter part of November.

MARASMIUS ON WHEAT

Many of the species of *Marasmius* habitually grow on fallen leaves and a variety of other dead plant parts. We had never, however, seen any of the Agaricales growing on wheat until the past summer when an interesting and remarkable instance was observed.

While examining a field of Red Wave wheat near Worden for the usual parasitic fungi a single dead culm was found with a number of fruiting stalks of a small mushroom, which had grown directly out of the basal node of the wheat stem.

The fungus is evidently a member of the genus *Marasmius* and appears to us to be closely allied to the species *M. scorodonius* Fr.

While these fungi are not characteristically parasitic, we think it probable in this case that, because of the size of the plant, the date of collection, the rotted roots and the discoloration in the basal node only, a parasitic condition did exist. L. R. TEHON

KASHMIR FUNGI

A collection of fungi recently presented to the Garden by Mr. R. R. Stewart, who collected them in late summer at Sonamarg, Kashmir, India, at an elevation of from nine to twelve thousand feet, proves very interesting because it contains such a large percentage of species found in New York. Hooker botanized extensively at Sikkim, India, fifteen hundred miles to the southeast, in a rainy region and his collections of fungi were quite different from those of Mr. Stewart. The Kashmir collection contains such familiar species as *Lentinus strigosus, Pleurotus ostreatus, Melanoleuca melaleuca, Pholiota squarrosa, Omphalia campanella, Strobilomyces strobilaceus, Lycoperdon giganteum, Auricularia auricula,* a form of *Thelephora palmata, Stereum hirsutum,* a giant form of *Calocera corniculata, Polyporus picipes* of European authors, *Pycnoporus cinnabarinus, Laetiporus sulphureus, Coltricia perennis, Bjerkandera adusta, Grifola umbellata* (a favorite edible species there), *Fomes ungulatus,* and *Elfvingiella fomentaria,* which occurs on birch as with us. A few species, however, have a very unfamiliar appearance and evidently do not belong to our flora. Among these I may mention a yellow *Poria* on birch, a very hirsute *Lentinus,* two or three species of *Mycena* and *Collybia,* and some boletes. *Gyrophragmium Delilei* Mont., represented in the collection by two specimens, is said to occur in southern France, northern Africa, and central Asia. It is very peculiar in appearance, suggesting a double-decked mushroom, the lower part expanding like a flower and bearing at its center a small cap supported on a stalk of its own. W. A. MURRILL

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